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FOR RAILROAD COOPERATION

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A T H O R E C O M M U N I C A T I O N
O F T H E S O U T H E A S T E R N
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FOR RAILROAD COOPERATION

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COMMUNIQUE ON THE FOURTH MEETING
OF THE CONFERENCE OF MINISTERS

The 4th meeting of the Conference of Ministers of the Organization for Railroad Cooperation of the Socialist countries took place from 14 to 20 May, 1959, in Bucharest, capital of the Rumanian People's Republic. There were delegations representing the railroad and highway transportation systems of Bulgaria, Hungary, North Vietnam, East Germany, China, North Korea, Mongolia, Poland, Rumania, the USSR, and Czechoslovakia. A representative of the Council for Mutual Economic Assistance was present as a guest. Comrade Dumitru Simulescu, Minister of Transportation and Communications of the Rumanian People's Republic, presided.

A series of resolutions was passed. They will be of great significance in further improving the performance of the railroad and highway transportation systems of the Socialist countries, in extending technical-scientific cooperation among them, and in increasing the efficiency of international transportation. The meeting took place in an atmosphere of friendship and mutual understanding. The resolutions were passed with the unanimous consent of all the delegations. Their implementation will be one more contribution to the economic and cultural development of the Socialist countries, as well as to fraternal cooperation between them.

WHEEL SETS ADAPTABLE TO VARYING TRACK GAUGES

by Alfred Grevesmuehl, Berlin, Engineer
and National Prize Winner

(We publish below excerpts from a report delivered before the fourth meeting of the Conference of Ministers in Bucharest. In January 1957, the member railroads of the SMPS and SMGS, meeting in Goerlitz, passed a resolution looking to the construction of gauge-adaptable wheel sets and the solution of all related problems. The East German State Railways carried the work through to completion, and early use of the wheel sets in public transportation is anticipated.)

With the sudden, sharp increase in traffic between countries whose track gauge is either 1435 or 1524 mm, the disadvantages involved in shifting from one gauge to another have become more and more of a burden. The large numbers of workers required and the reduction in reliability and speed of transportation promise to become intolerable in the future. New transfer methods are needed to increase the capacity of the transhipping stations. One thing is obvious; all difficulties would be eliminated by using wheel sets adaptable to different gauges, making it possible for whole trains to be shifted from one gauge to another in a matter of minutes.

The East German State Railways have been working for several years on the development of such wheel sets. It was a difficult problem from the beginning, because there was no previous experience from which to develop the complicated operational requirements first to be considered. During the initial tests, in 1957, certain technological phenomena were observed which required further investigation. The construction principles finally evolved are as follows:

(1) The dimensions of the adaptable wheel set must not vary too much from those of a normal set, so as to permit interchangeability. The adaptable set must be reliable, simple in construction, and equal to the hard use to which it will be put.

(2) All wheels should be uniformly tight. If one is looser than the others, the so-called sine movement of the wheel set does not take place, and one wheel disc is in contact with the rail longer than the others. This causes heavy wear and tear on the flange and increases the danger of derailing.

(3) The stress-endurance limit of the axle must be considered at all times. Notches, grooves and holes are to be avoided, since they favor the development of cracks and breaks, which can be very dangerous in axles subjected to severe strains.

(4) The wheel disc must be locked securely to the shaft. The locking device must not be subject to wear and tear, and must be so perfected that the track width set any given time will remain constant. There should be no possibility of self-activated release. The setting must be visible from the outside.

(5) All structural parts of the locking device should be such that they will remain unaffected by long periods of use. Only those springs should be used which can be inspected frequently without hindrance to their operation and, when necessary, can easily be changed.

(6) Many of the constituents of regular wheel sets, such as axle-tree boxes, shaft bearings, etc., should be usable in the adaptable sets without change.

(7) Only bearings that have been standardized and are equal to heavy, dynamic stresses should be used as secondary bearings.

(8) The shift from one gauge to another should take place at special gauge change-over track layouts. It should take place at speeds of from 30 to 40 kmh, and be feasible for cars travelling in either direction.

(9) The wheel sets should be usable on rail cars, especially self-propelled motor cars.

Several designs proved sound in their basic concept, but were not developed further. The one selected as having the best prospect of successful operation, the Kramer-Necke wheel set, was built and tested in 2 models. It was the result of cooperation among a large group of experts, including the East German Minister of Transportation, Graduate Engineer Kramer. A Soviet group also took part in the final evaluation.

The first model, designated KrN I, was developed in 1955 and 1956. It differs from the uncompleted design types in that the locking-and-tie-rod system originates on the axle bearing housing, instead of the axle itself. The relative movement that develops between the stationary housing and the rotating wheel disc made it necessary to install an additional bearing in the disc. Model I has friction bearings and model II has anti-friction (ball) bearings. That is the main difference between them.

Two-pressed-on discs (part 2 in the first diagram) rise to equal distances from the axle center-line (part 1) and are kept in permanent contact with the displaceable wheel disc (3) by connecting pins. The wheel disc can by this means be displaced horizontally to conform to the track gauge at any given moment.

In an integrally-cast circular housing on the wheel disc are mounted 2 sliding discs (4), between which is fixed the flange of a double sliding nut (5). A ring nut (6) seals the housing off against oil and dirt, and makes possible any adjustments which become necessary because of wear and tear on the sliding discs. Spontaneous loosening of the ring nut is prevented by a safety lug (7). While the 2 sliding discs revolve with the wheel disc, the double sliding nut remains stationary with the 2 tie rods (8). A tie rod plate (9) forms a dirt- and oil-proof closure on the reverse side of the roller bearing housing.

Two equally spaced tie rods run vertically from the horizontal center line of the axle to guide pieces on the sides of the tie rod plates. The 2 rods engage with interlocking grooves inside the double sliding nuts and thus complete the locking-and-tie-rod system. This interlocking is effected through 2 very strong compression springs (10), which insure reliable functioning of the tie rods. The springs are led by guide bars (11) through traversing slides that are solid with the tie rods. Two bearing brackets (12) and a roller bearing holder (13) are fixed to the lower tie rod. Attached to the bearing brackets are 2 plungers (14), whose upper ends are in turn flexibly joined to rocker arms (15). These are supported by the tie rod plate, and with the upward movement of the lower tie rod impart a matching downward thrust to the lower tie rod, thus putting the compression spring under stress.

The advantage of the 2 pressed-on discs (2) is that during the change-over the distance from the top surface of the rail to the center line of the axle remains constant, since the discs are not subject to wear. Furthermore, since wearing of the wheel rims is of no concern, the unchanging distance between the rail and the axle insures precision during the tie-rod locking process and the change-over of the wheel set. The shift from normal to wide gauge or vice versa takes place while the train is traversing the special track layout for this purpose. The 2 discs run onto the auxiliary rails and are held there. The wheel set is raised at least 5 mm. from the rails, and the wheel discs, relieved of their load, are displaced horizontally and guided onto the new gauge. During the unlocking process, the guide wheels run onto the guide rails and the tie rods are forced back toward the axle center line until they no longer engage with the interlocking grooves. During the locking process, the guide wheels run off the guide rails and the compression springs force the tie rods back into the interlocking grooves. The wheel set is then adjusted to the new gauge.

The second model, the KrN II, is essentially the same as the first. Two pressed-on discs (part 2 in the 2nd diagram) rise from the axle (1) and are in permanent contact with the horizontally displaceable wheel discs (3). In a housing integrally cast with the wheel disc is a grooved ball bearing (4), secured by a disc-shaped lid (5). A double sliding nut (8), with interlocking grooves on the inside, is located in the inner race of the ball bearing, held in place by a ring nut (6), and secured against loosening by a locking plate (7). The axle-bearing housing forms the foundation for a tie rod plate, from which 2 tie rods rise vertically. The locking and unlocking processes are the same as in the KrN I.

Contrary to expectation, ball bearings proved, under test, equal to all dynamic stresses, hence superior to friction bearings. Corrosion phenomena (oxidation) caused by high pressures in the bearings gave some trouble, but a combination of materials was found which eliminated this difficulty. It is apparent that basic research is needed on certain general questions concerning bearings.

The final stage of the developmental work consisted of test runs, at speeds up to 120 kmh, by a train made up of fully loaded, large-size cars having an axle load of 20 tons. Nothing untoward developed, and cars using the new wheel sets will soon be in public transportation. It would be desirable to establish a follow-up group to maintain a continuing check on their operation. Further work might be necessary to achieve optimum efficiency.

SAFETY NEWS FROM THE RAILROADS OF THE USSR

by B. S. Rjasanzew, Chief Engineer of the Safety
Division of the Ministry of Transportation of the
USSR

The 7-Year Plan, in addition to the prospects it offers for the national economy, presents a challenge to the State Railways. The railroad freight turnover is to be 40 to 50% greater in 1965 than in 1958. About 100,000 km of track will be electrified and dieselized. From 83 to 92% more money will be made available for development than in the previous 7 years.

An important part of the railroads' program is the introduction of new safety devices. From 1959 to 1965, lines totalling 18,000 to 20,000 km will be equipped with automatic blocking and centralized traffic control. The State Railways have already had extensive experience in automatic blocking, electric interlocking, centralized traffic control, automatic locomotive cab signalling, train control, mechanization of hump operations and other technical matters. The systems used are well known in the USSR and abroad, and have often been discussed in the technical literature. In recent years, Soviet technologists have been working on new systems. Their aim is to increase operating safety, improve working conditions and make safety devices cheaper, while continuing to meet all operational requirements.

Many new electric interlocking installations will be built during the next 7 years. Even those built in the past used relay panels already assembled and equipped in the shops. Two installations completed at the beginning of 1959 have a new type of plug relay which, despite its small size, complies with all first-class safety regulations. Moreover, it uses 80% less non-ferrous metal than the normal-size relay, and 85% less than the still earlier Nr-relay. The plug relays are housed in smaller buildings, reducing interlocking construction costs by half.

Soviet engineers have developed a new electric interlocking system in which groups of up to 8 small relays, equipped with plug contacts, are installed in or removed from the panels as a unit. The perfected system will be used first at certain railroad stations in 1959, but modifications of it have been tried at 2 stations during the past 2 years. Separate, removable units are used for separate purposes, such as switches, signalling, rail brakes, etc. The shops can now enter into quantity production of standard relay units for use at all stations. The feasibility of applying the above system universally will soon be decided on.

Hitherto, the railroads have used only varieties of drive-on coupling Auffahrkupplung of point motors for switches whose blades are not interconnected. A motor without that type of coupling is now being tested and is expected to be introduced in 1959. It will be for heavy-duty switches (for rails weighing 50, 65 and 75 kg/lfm) with long blades that have to be interconnected. To avoid using larger cables and greater voltage, no performance increase is being sought. It should be noted that in the Soviet railroads a 2-wire system is presumed for point motors supplied with 220-watt continuous current, being considered more economical than that in a 3-phase, alternating-current motor. New power equipment with metal rectifiers instead of storage batteries, backed by an emergency supply, will complete the electric-interlocking modernization program.

As centralized traffic control becomes more widespread, the main system of code control will be the frequency code system developed by Soviet engineers. This uses the 500-800 and 1650-2550 cycles-per-second audio-frequency bands both for ordering and reporting code, with transmissions at intervals of 1.0 seconds for ordering, and 0.25 seconds for reporting. A multiplex system, it can handle in 1 channel a traffic sector of any practicable length desired. Even in case of a shunt, it can function by using high-frequency channels or channels for radio-relay circuits. It uses the same semi-conductors and magnetic batteries which are replacing the contact relays associated with the complicated intermittent signalling of analogous systems. Its main structural parts and elements exercise remote control of signals and switches in outlying parts of larger railroad stations and junctions. This means many fewer cable lines in building electric interlocking installations.

Automatic blocking has long been the chief means of increasing the traffic-handling capacity of heavily travelled lines. Using alternating current, it has been introduced on all electrified lines, and is scheduled for most of the lines due to be electrified in the near future. This system makes automatic cab signalling and train control possible without additional equipment. In the USSR, it has been perfected to the point where it is virtually a new system, which is now being tested. Recent modernization has resulted in the use of non-contact intermittent relays, magnetic amplifiers (instead of current transformers), and small, mass-produced relay units. The non-contact relays are a major contribution to operating safety, and their use also reduces the number of periodic inspections required. New selection methods for reporting a train's approach to or passage through a station make it possible to dispense with special circuits for this purpose. In the next 7 years, 50-cycle alternating current will be

introduced to a maximum extent in the USSR railroads. Special track-circuit filters will protect the track relays in those sectors where 75 cycles-per-second automatic code blocking is either now in use, or will be, under the modernization program.

An already tested system for keeping a constant check on the speed of trains is being considered as a supplement to automatic code signalling and train control. When the permissible speed signalled to the engineer is exceeded, the train is braked automatically. On several lines the dispatcher guards against failures in centralized traffic control by watching on a screen train locations and the display of station signals. Beginning in 1959, a new system, based on the principle of reciprocal observation of objects, will be introduced. Used in conjunction with a new train movement recorder, it will present a continuous picture of the local traffic situation.

In scientific laboratories, design offices, planning institutes and workshops, an unceasing effort is being made to develop more effective systems and devices to further insure the safety of railroad operations.

HUNGARIAN EXPERIMENTS IN JOINING CONTINUOUS WELDED RAILS

By Graduate Engineer Adalbert Unyi, Budapest

As is well known, there are 2 ways of joining welded rail lengths to fished (overlapped) track or to switches:

- (a) Leaving a so-called breathing space at the end of the jointless section to allow for small movements at the rail ends;
- (b) Without a breathing space, longitudinal changes at the end of the jointless section being kept in check.

The Hungarian State Railways have carried out experiments using both methods.

Expansion-Joint Method

The Hungarian railroads use the "Csillery" expansion-joint system, which has proved highly satisfactory in bridge superstructures for 30 years. This is based on 2 opposed rail tongues, corresponding to the joined ends of 2 normal sections, which are placed side by side on a baseplate 1430 mm long. One tongue is fixed, and the other can move in a horizontal direction; movement is possible because the track bolts are loosely secured in oval-shaped holes in the fishplates. The "Csillery" joints come in 3 types, for maximum movements of 80, 110 and 160 mm. The tongues have finished surfaces back to a distance of 1000 mm from the tips. The section where they are in overlapping juxtaposition is like a rail with a double web (figure 1).

The unequal rail lengths which meet at the expansion joint are the determining factor in the joint's satisfactory installation or alignment.

In order to decide how to join or weld the expansion joint to the end of the welded rail, one must first determine the length of the breathing space (Z_0).

The longitudinal force, P , set in motion by temperature change, is absorbed within the length of the breathing space (Z_0) by longitudinal resistance of the track, p . It may be assumed that the value of P remains constant in the vicinity of the breathing space. Since expansion joints are usually installed between spring and fall, a rather small value should be assumed for longitudinal resistance: $p = 5 \text{ kg/cm}$.

The force set in motion by temperature change:

$$P_{\text{mean}} = \alpha \cdot E \cdot \Delta t \cdot F = \alpha \cdot F \cdot p$$

From Figure 2:

$$Z_0 = \frac{P}{p} = \frac{\alpha \cdot F}{p}$$

α = coefficient of expansion of rail per $^{\circ}\text{C}$, $11.5 \cdot 10^{-6}$

E = coefficient of elasticity of rail, $2.15 \cdot 10^4 \text{ kg/cm}^2$

F = cross-sectional area of rail, cm^2

Δt = temperature change, $^{\circ}\text{C}$

p = longitudinal resistance of roadbed, kg/cm

The force set in motion in a type 43 jointless rail by maximum temperature change is:

$$P = 11.5 \cdot 10^{-6} \cdot 2.15 \cdot 10^6 \cdot 61.56 \cdot 45 = 68490 \text{ kg} = 68.49 \text{ tons}$$

Where $p = 5 \text{ kg/cm}$, the length of the breathing space is:

$$Z_0 = \frac{68.49}{5} = 136.98 \text{ m.}$$

Where $p = 10 \text{ kg/cm}$:

$$Z_0 = \frac{68.49}{10} = 68.49 \text{ m.}$$

The increase in Z_0 caused by temperature change can easily be computed by Hooke's Law:

$$Z_0 = \frac{P_t \cdot Z_0}{E \cdot F} \quad (P_t = P_{\text{mean}}).$$

Value of Z_0 :

$$\Delta Z_0 = \frac{P_t}{p} = \frac{\alpha \cdot F}{2p}$$

Thus:

$$\Delta Z_0 = \frac{S \cdot F}{E \cdot F} \cdot \frac{S \cdot F}{2 \cdot p} = \frac{S^2 \cdot F}{2 \cdot p \cdot E}$$

Breathing-space/temperature-change relationships and breathing-space changes where $p = 5-10$ kg/cm are plotted in Figure 3, which is based on data obtained from a type 48 roadbed. It will be seen that rail-end movements of more than 70.89 mm need not be expected. A maximum temperature of +60 °C was assumed for complete closure of the rail tongues.

Decreasing temperatures mean an increase in the density of the roadbed, and consequently greater values for p . Below 0 °C, when the road bed freezes, p even reaches values of 10-15 kg/cm.

If $\Delta Z_0 = 63$ mm when $p = 5$ kg/cm and the temperature range is 60 °C (between +60 °C and 0 °C), then ΔZ_0 reaches its maximum of 70.89 mm when $p = 10$ kg/cm and the range is 90 °C (between +60 °C and -30 °C, an extreme case). It must be emphasized that this scarcely ever occurs. If such an extreme range should be experienced, the maximum ΔZ_0 would not be reached a second time, because expansion and contraction of the rails or track are an irreversible process. This fact gives certainty to the process of determining the opening (space) for the expansion joint.

When a "Csillery" joint with an 80-mm tolerance is fitted to a type 48 rail, 70.8 mm is for the rail and 9.2 mm for the connecting part. The proportion depends on whether the portable rail section to which the expansion joint is welded is 16 or 24 m long.

When the 2 tongues are in complete contact, the centerline of the finished section coincides with the centerline of the baseplate (Figure 4). The expansion joint is then in normal position, and each tongue can move 40 mm under the influence of temperature change. In the situation depicted in Figure 5, allowance has been made for a movement of 70.9 mm by 1 tongue and 9.1 mm by the other, which will take place when the baseplate is moved a distance of $\frac{80}{2} - 9.1 = 30.9$ mm in the direction of the lesser movement. 2

This is the situation which will occur with the maximum rail temperature to be expected in Hungary (60 °C).

Two tongues which are completely closed when put in place will draw apart because of the prevailing temperature at the time. The amount of this movement for the shorter portion of the joint can be taken from the Table of Distances for Rails 8 to 12 Meters Long. The opening (space) of the longer portion is shown in Figure 6.

A Table of Distances can be drawn up for the longer portion of the "Csillery" joint for installation temperatures between 0 and 35 C°. The change in length of the breathing space (Δz_0) because of temperature difference (Δt) can be computed from the formula:

$$\Delta z_0 = \frac{(\alpha \cdot E)^2 \cdot \Delta t^2 \cdot F}{2 \cdot E \cdot p}$$

The table shows movements beginning with the completely closed position. Δt is the difference between 60 C° and the temperature at time of installation (welding).

The table assumes a constant value for p , and ignores friction between the tongues. The values listed are therefore maximum, and somewhat larger than those usually occurring in practice. There are no temperature-induced stresses in a properly installed joint.

The following table applies to a type 48 roadbed, using values of

$$\alpha = 11.5 \cdot 10^{-6}$$

$$E = 2.15 \cdot 10^6$$

$$F = 61.56 \text{ cm}^2$$

$$p = 5 \text{ kg/cm}$$

Rail temperatures	Opening from finished section centerline, mm	Rail temperature	Opening
0	63.0	18	30.9
1	60.9	19	29.4
2	58.9	20	28.0
3	56.9	21	26.6
4	54.9	22	25.3
5	52.9	23	24.0
6	51.0	24	22.7
7	49.1	25	21.4
8	47.3	26	20.2
9	45.5	27	19.1
10	43.8	28	17.9
11	42.8	29	16.8
12	40.3	30	15.7
13	38.7	31	14.7
14	37.0	32	13.7
15	35.4	33	12.8
16	33.9	34	11.8
17	32.4	+ 35	10.9

Measurements taken at test sites show that actual movements are somewhat less than those indicated in the table. Roadbeds get packed down under the constant passage of traffic, so that their longitudinal resistance gradually becomes greater than the value of $p = 5 \text{ kg/cm}$ assumed at the time of installation of the joint. The table is, nevertheless, useful for all practical purposes.

The "Csillery" expansion joint system has proved as satisfactory with continuous welded rails as it has with railroad bridges.

Methods Using Overlapped Butt Joints

Here, the length of the breathing space is a factor of the space between the rail ends and the longitudinal resistance in the track.

As already mentioned, the maximum temperature-induced force in a horizontal direction is:

$$P = \alpha \cdot E \cdot \Delta t \cdot F$$

At the end of the breathing space, this force works against the following counteracting forces: resistance (friction) of the fishplates, longitudinal resistance of the rail in the breathing space, and (in certain instances) the supporting capacity of the track bolts. Therefore:

$$P = H + p \cdot Z_0 + C_s, \text{ where}$$

H = fishplate resistance (kg)

p = longitudinal resistance per cm of rail length (kg/cm)

C_s = force absorbed by the track bolts (kg).

Of the longitudinal force set in motion by temperature change, about 15-20 tons are absorbed by the resistance of the fishplates.

The subsequent movement of the rail ends continues until the space left on installation (welding) is closed, which can be computed from the diameters of the fishplate holes, the rail drillholes and the track bolts. The force still remaining is taken up by the track bolts.

Let us investigate the 3 separate counteracting forces:

(1) The value of H can be determined experimentally. On a type 48 roadbed, with well-tightened track bolts, it comes to about 15-20 tons on an average.

(2) The formula

$$\Delta Z_0 = \frac{P_t \cdot Z_0}{E \cdot F} = \frac{p \cdot Z_0^2}{E \cdot F}$$

can be used to determine the length of a breathing space (Z_o) with checked expansion:

$$P_t = P_{mean} = p \cdot Z_o$$

$$Z_o = \sqrt{\frac{E \cdot F \cdot \Delta Z_o}{p}}$$

ΔZ_o represents the temperature-induced change in length of the breathing space. Values of p and Z_o can also be computed:

$Z_o = 100 \text{ mm}$ and $p = 10 \text{ kg/cm}^2$.

$$Z_o = \sqrt{\frac{2.15 \cdot 10^6 \cdot 61.56 \cdot L}{10}} = 35.12 \text{ mm}$$

$$p \cdot Z_o = 10 \cdot 35.12 = 35.12 \text{ tons}$$

(3) If a value of 15 tons is assumed for H , or the maximum force

$$P = \alpha \cdot E \cdot F \cdot \Delta t = 11.5 \cdot 10^{-6} \cdot 2.15 \cdot 10^6 \cdot 61.56 \cdot 45 = 68.49 \text{ tons,}$$

that falling on the track bolts is $68.49 - (35.12 + 15) = 18.37 \text{ tons}$.
If $H = 20t$, 13.37 tons fall on the bolts.

Track bolts have hitherto been checked for shearing stress, as though they were a type of double-shear rivet connection. This was because the pressures on them are generally less than the allowed stress, whereas the shearing stress is closer to the allowed limits. It is a mistake to equate the 2, however, for the bolts go through much larger holes than do rivets. The diameter of both the rail holes and the fishplate holes is larger than that of the track bolts, so that when the last are pulled, they touch the fishplate or rail holes, not with their cylindrical surfaces, but with their surface lines.

There is also a considerable distance between rail web and fishplate, because of the wedge effect of the latter. This is quite different from the situation with girder rivets. Track bolts are subject to shearing and bending stress, as well as to strain.

Because of the complicated play of forces involved, the value for the force absorbed by the track bolts is best determined experimentally. To this end, tensile tests have been run on type 48 overlapped rail joints in the Amsler strength-testing machine. Values of H (fishplate resistance) and the actual, maximum stress can be taken from graphs. These refer both to normal track bolts with a tensile

strength of 34 kg/mm^2 , and to bolts of a special material with a strength of 80 kg/mm^2 .

It is interesting to compare the maximum stress-capacity of the bolts, as determined experimentally, with that computed from double-shearing tests. The normal bolts (as above) absorbed in the latter cause a force of

$$S_{ny} = \frac{2 \cdot d^2 \cdot \pi}{2} \cdot \bar{T}$$

where $\bar{T} = 980 \text{ kg/cm}^2$.

$$S_{ny} = \frac{2 \cdot 2 \cdot 2.3^2 \cdot 3.14}{4} \cdot 980 = 16.278 \text{ kg.}$$

If $H = 20 \text{ tons}$, the bolts would have to withstand

$$16.278 \text{ [sic]} + 20.000 = 36.278 \text{ kg.}$$

In the tensile tests, however, breaks did not occur in the bolts until they were subjected to 45-47 tons, a considerable difference.

The tensile tests also confirmed that even the normal bolts can absorb greater stress than that (C_g) falling on bolts in butt (overlapped) joints in continuous rails.

Tensile tests were also run on the special track bolts (as above). Those of more brittle material had a higher maximum stress-capacity than that computed from double-shearing tests. It was striking that bolts of greater tensile strength broke clean, while those of more yielding material twisted before breaking. No denting or other distortion was noted in the rail or fishplate holes as a result of the tests. The 4 bolts designated by the number 1 had a tensile strength of 34 kg/mm^2 ; those with the number 5, 80 kg/mm^2 (Figure 8).

1	2	3	4	5	6
Track bolt tensile tensile	Tr. bolt frictional force (av.) $H = \text{tons}$	Calculated shearing stress $S_{ny} = \text{tons}$	$2 + 3$ $H + S_{ny}$	Tensile str., by test	$5 + 6$ %
34/40	20	16.278	36.278	46.000	126.8
60	20	37.870	57.870	56.100	97
80	20	56.800	73.600	73.600	95.8

Once a determination has been made of the force which counters the temperature-induced forces in the butt joint of a continuous welded rail, it is possible to compute the size of the opening (space) to be left. It is quite proper to assume that the induced force, P_t , is absorbed within the length of the breathing space, Z_o , by fishplate resistance, H , and longitudinal resistance of the track, p . To provide a margin of safety, the maximum resistance of the track bolts, C_s , is disregarded. The Hungarian Railways assume the following values in computing the size of the opening:

$$\text{above } 0 \text{ }^{\circ}\text{C} \quad p = 5 \text{ kg/cm}$$

$$\text{between } 0 \text{ and } -10 \text{ }^{\circ}\text{C} \quad p = 5-15 \text{ kg/cm, } 10 \text{ kg/cm on the average}$$

$$\text{below } -10 \text{ }^{\circ}\text{C} \quad p = 15 \text{ kg/cm}$$

If, for safety reasons, a value of only 10 tons is assumed for H , the following values are obtained for the size of the opening, h , in a portable line section 24 m long:

$$\text{at } +20 \text{ }^{\circ}\text{C, neutral temperature } h = 2 \text{ mm}$$

$$+15 \text{ }^{\circ}\text{C} \quad " \quad " \quad h = 6 \text{ "}$$

$$+10 \text{ }^{\circ}\text{C} \quad " \quad " \quad h = 8 \text{ "}$$

$$+5 \text{ }^{\circ}\text{C} \quad " \quad " \quad h = 9 \text{ "}$$

The graph in Figure 3 and the diagram at the end of this paragraph were used in making the above computations. When these openings are used, there is tensile stress on the track bolts only when the temperature is below $-30 \text{ }^{\circ}\text{C}$. According to the tests described above, bolts in type 48 overlapped track usually break under a tensile load of $C_s = 46 - 20 = 26$ tons.

A temperature change of $1 \text{ }^{\circ}\text{C}$ sets in motion the following force in a type 48 rail:

$$P_t = \alpha \cdot E \cdot F = 11.5 \cdot 10^{-6} \cdot 2.15 \cdot 10^6 \cdot 61.56 = 1.521 \text{ kg.}$$

A force of $C_s = 26$ tons would be set in motion by a temperature change of

$$\frac{26.000}{1521} = 17 \text{ }^{\circ}\text{C}$$

Since, with openings of the sizes listed above, there is no tensile stress on the bolts until the temperature reaches -30°C , the bolts will not break until the temperature reaches $-30 + -17 = -47^{\circ}\text{C}$. Safety is insured by the fact that a temperature below -35°C has never been recorded in Hungary.

If, with the above openings, a portable line section 24 m long has to be changed, the bolts in the adjoining welded rail should be placed at the following intervals:

$+20^{\circ}\text{C}$	neutral temperature	79 m
$+15^{\circ}\text{C}$	" "	60 m
$+10^{\circ}\text{C}$	" "	42 m
$+5^{\circ}\text{C}$	" "	32 m

It is possible to compute the temperature at which the joint rails will close. With a neutral temperature of $+15^{\circ}\text{C}$ (when the opening should be 6 mm):

$$\Delta t \cdot \alpha \cdot l + \frac{\sigma^2 \cdot F}{2 \cdot E \cdot p} = 0.6$$

$$\Delta t \cdot \alpha \cdot l + \frac{(\alpha \cdot E)^2 \cdot \Delta t^2 \cdot F}{2 \cdot E \cdot p} = 0.6,$$

where $\alpha \cdot E = 24.72$

$F = 61.56 \text{ cm}^2$

$p = 5 \text{ kg/cm}^2$

$l = 1200 \text{ cm}$

From this, it follows that $\Delta t = +15^{\circ}\text{C}$, and the closing temperature is $15 + 15 = 30^{\circ}\text{C}$.

When such is the case, the temperature-induced force in the breathing space and the adjoining portable section increases to

$$P_t = (60 - 30) \cdot 1.521 = 45.65 \text{ tons}$$

The results of the tensile tests and the above computations confirm the experience of several railroads (those of East Germany, Czechoslovakia and other countries), that in joining continuous welded rail lengths, an expansion joint is not necessary. If there should be an isolated line section at the end of such a rail, it can be taken care of by inserting an insulating section 24-36 m long on either side.

Joining Continuous Welded Rail Sections Without a Breathing Space

This situation occurs when a section of continuous rail is welded to a switch or switch unit. A low neutral temperature must be worked out, so as to preclude the possibility of secondary stresses arising during the welding process. The sum of the temperature computed from the secondary stresses arising from welding shrinkage and of the applied effective welding temperature should be equal to the remaining applied neutral temperature.

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FROM THE WORK OF THE COMMITTEES OF THE
RAILROAD TRANSPORTATION COMMISSION

The Third Committee Takes Up Clearing Regulations
for SMPS and SMGS

The Third Committee on Rates and Economic Questions met in Warsaw from 2 to 9 April, 1959, to discuss clearing regulations for SMPS and SMGS. Delegations were present from Bulgaria, North Vietnam, East Germany, North Korea, Mongolia, Poland, the USSR and Czechoslovakia.

Since more than three years had passed since the last meeting, it was necessary to consider the changes and supplements that had accumulated in the meantime. The delegates discussed the rough draft of a new edition of the regulations which had been prepared by the working group on the basis of proposals made by the member railroads. Their final draft was approved by the Commission on 24 April 1959 and will become effective on 1 January 1960.

Under the new regulations, statements of shipping charges for freight in international traffic will be made out by intermediate stations, and not, as hitherto, by terminal stations, regardless of whether the intermediate station's fee is paid by shipper or receiver. The same forms will continue to be used. Actually, such a procedure has been followed between some stations all along. An intermediate station can obviously estimate its own shipping fee better than a terminal station, and is in a better position to figure in domestic tariffs and include extra charges where they occur. It will no longer be necessary to make out supplementary statements or exchange tables, and the flow of exchange between the countries concerned will be expedited.

There was also a discussion of the discounts allowed travel agencies in the sale of SMPS tickets, which some delegates thought are too large. They have submitted a request to the Commission to study the matter, and, in consultation with the member railroads, issue a clarification.

Experts Discuss Types of Containers
and Air Conditioning

The Sixth Committee called a meeting of experts in Warsaw from 24 to 28 March 1959 to take up standardization of containers used for freight shipments in direct international traffic. Present were representatives from Hungary, East Germany, Poland, the USSR and Czechoslovakia.

The main purpose of the meeting was to make recommendations with regard to standardization and draw up plans for further work in this field. Dimensions and technical specifications were evolved for planning purposes. The railroads of the USSR were given the task of producing the main parameter, technical specifications and preliminary sketches of shipping containers for use on open cars. The East German railroads will work on small, wheeled containers. In view of the need for large-capacity containers, the experts suggested the possibility of developing a trailer-type, and asked for recommendations from the member railroads.

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From 9 to 11 April 1959, experts from Hungary, East Germany, Poland, the USSR and Czechoslovakia discussed in Warsaw the choice of air-conditioning systems for passenger cars and refrigerating systems for dining cars. After listening to a paper read by the USSR delegate and reports presented by others, they took up the recommendations formulated by the working group with regard to air-conditioning and pressure-cooling systems for passenger cars and refrigerating systems for dining cars in international traffic. The experts recommended that these questions be considered under the cooperative research program.

Meeting of the Sixth Committee

A meeting took place in Warsaw from 1 to 12 June 1959 attended by representatives from Bulgaria, Hungary, East Germany, China, North Korea, Poland, Rumania, the USSR and Czechoslovakia. A representative of the Council for Mutual Economic Assistance and two representatives of the UIC were present as guests.

The agenda was taken up by four Sub-Committees. The First occupied itself with car clearances and clearance limits. The Second, with car standardization. The Third, with standardization of car parts. The Fourth, with standardization of automatic brakes and couplings.

In compliance with the approved agenda, the Sub-Committees heard progress reports on the tasks assigned by the Leningrad meeting of 7 to 26 May, 1958. These technical-scientific reports were left with the Sub-Committee for study and the formulation in due course of recommendations and resolutions.

The First Sub-Committee discussed the following matters:

- (1) Proposed top clearance limits for electrified stretches of OSShD railroads.

(2) Theoretical and experimental work to determine the spatial disalignment of cars operating at various speeds.

(3) Increasing the 1-SM clearance with a view to providing room for future installations and additions.

(4) Determining more precisely and changing the measurements of cars with 0-WM and 1-WM clearance limits.

Most of the member railroads of the OSShD have completed their investigations to determine what stretches will allow the passage of cars with 0-WM and 1-WM clearance limits, and have begun the necessary work of reconstruction and conversion. The Commission was asked to make in the near future a comprehensive survey of the clearance situation throughout the OSShD rail net, and send the results to the member railroads. The latter are being asked to draw up conversion plans to allow the passage on all important stretches of cars with 0-WM clearance limits, and, on certain international trunk lines, of cars with a clearance of 1-SM.

The Sub-Committee members considered it desirable to specify a standard form and terminology for the member railroads' progress reports on work in this field, and to so inform the UIC, which will be asked to study the feasibility of increasing car clearances and clearance limits on the railroad systems of its members.

With regard to top clearance limits on electrified stretches, the Commission was requested to direct the Eighth Committee to recommend a safety zone based on current voltage. Pending accomplishment of this, the Sub-Committee specified top limits for electrified stretches with overhead lines, broken down into two separate groups. In the first are the railroads of Bulgaria, Hungary, East Germany, North Korea, Poland, Rumania and Czechoslovakia; in the second, those of China, Mongolia and the USSR. It was considered necessary that the two sets of clearance limits be brought into as close conformity with each other as possible.

The Sub-Committee recommended that evaluation of the theoretical and experimental work done on the spatial disalignment of cars be completed by the end of 1960, at the latest.

It was decided to take up certain definitive calculations of clearance limits at the next meeting, following interim study by the Sub-Committee.

The Sub-Committee recommended that the next PPW meeting initiate the special marking of cars for 0-WM and 1-WM clearance limits.

The Second Sub-Committee discussed the following:

- (1) Standardizing the basic parameter, dimensions and fittings of the 4-axle tank cars.
- (2) Standardizing the dimensions of 4-axle, covered freight cars.
- (3) The choice of types and the parameter of air-conditioning and pressure-cooling systems for passenger cars and of refrigerating systems for dining cars used in international traffic.
- (4) Standardizing containers and pallets for direct international freight traffic.
- (5) Standardizing the dimensions of car bodies and type B passenger train compartments.
- (6) Standardizing the parameter and furnishings of type B passenger cars with berths.

A recommendation was passed calling for standardization of the 4-axle tank car with a capacity of 60 cubic meters, used to carry petroleum and petroleum products in international traffic.

Standardization of the rig of 4-axle tank cars was recommended.

The Sub-Committee members held that it would be desirable to include in the Fifth Committee's program plans for a study of the technical-economic feasibility of using 4-axle tank cars with a capacity of 75 cubic meters for shipping low-density petroleum products.

They looked into the matter of standardizing 4-axle, covered freight cars with a carrying capacity of 60 tons, and recommended two types: A, with a car body having a total capacity of at least 120 cubic meters; B, with a car body having a total capacity of at least 90 cubic meters. The latter is to have two door apertures in each sidewall of at least 2000 x 2000 mm. each, or one aperture in each side wall of at least 2000 x 4000 mm.

The Sub-Committee recommended that the cars of international passenger trains be provided with air-conditioning or pressure-cooling systems, depending on climatic conditions likely to be encountered,

and that dining cars have refrigerating systems for their perishable provisions. Technical specifications were laid down. It was deemed appropriate to include in the scientific research program studies to find reliable types of equipment for the above systems.

After considering a plan to standardize during a transitional period the containers and pallets used in international freight traffic, the Sub-Committee recommended use of the following types:

- (1) A small container with a carrying capacity of 1-1.5 tons and a usable inside volume of 1-3 cubic meters.
- (2) A medium container with a carrying capacity of 2.5-3 tons and a usable inside volume of 4.5-6 cubic meters.
- (3) A large container with a carrying capacity of 5 tons and a usable inside volume of 7-15 cubic meters.

In addition, it was considered worthwhile to develop in the near future new types of standard containers, to be manufactured by the member railroads. The Sub-Committee laid down technical specifications which meet the requirements of railroad and highway transportation.

The following recommendations were made with regard to standard type B railroad cars equipped either with seats alone or with a combination of seats and berths:

Length of car, buffer to buffer	24,000 mm
Length of car body	about 23,700 mm
Width of car	about 2,800 mm
Width of compartment	at least 2,000 mm
Width of passageway	at least 710 mm

Number of compartments and seats

(a) 1st class car with seats

No. of compartments	9
No. of seats	$9 \times 6 = 54$

(b) 2nd class car with seats

No. of compartments	10
No. of seats	$10 \times 8 = 80$

(c) 1st-2nd class car (combined)

No. of 1st class compartments	4
No. of 2nd class compartments	5
No. of 1st class seats	4 x 6 = 24
No. of 2nd class seats	5 x 8 = 40

The following recommendations were made for the cars having both seats and berths, which essentially correspond to the 1st class or 1st-2nd class, type B passenger cars:

No. of compartments	9
No. of seats	9 x 8 = 72
No. of berths, maximum	9 x 6 = 54

The compartments will be equipped with 6 upholstered berths, 3 on each wall. The 2 middle ones can be let down and the space used for stowing luggage.

The suitability of longer cars for international traffic was explored.

The Third Sub-Committee drew up a series of plans and technical specifications for car parts and related matters. It decided that standard techniques should be developed under the following categories for repairing and reconditioning cars used in international traffic:

- (a) Inspecting, reconditioning and making routine repairs on passenger cars in stations and repair shops.
- (b) Inspecting and making routine repairs on freight cars at railroad station testing areas. Disinfecting freight cars.
- (c) Repairing wheel sets.
- (d) Repairing car springs.
- (e) Repairing screw couplings.
- (f) Repairing axle bearings and axle bearing housings (friction and anti-friction bearings)

The railroads charged with making recommendations must submit them to the Commission by 1 April, 1960.

To assist in standardizing car parts, basic dimensions were proposed for:

- (1) Flat and spherical bearing sockets for freight cars.
- (2) Flat bearing sockets for passenger cars.
- (3) Sliding contacts

The Sub-Committee received the detailed, completed specifications for pivot mountings for freight and passenger cars. When approved, they will form the basis for developing standard mountings for use in international traffic.

It was moved that certain matters, such as methods of designing shafts and estimating the working life of axle roller bearings, be turned over to the Fifth Committee to pass on to the technical institutes for further study.

The Fourth Sub-Committee gave its approval to the revised technical specifications for standard brakes for locomotives operating with freight trains at speeds up to 120 kmh and with passenger trains operating up to 160 kmh.

It made a recommendation as to the chemical composition of the material used in metal brake shoes.

The Sub-Committee worked out a method of computing the counterpoise and the brake pressure, as well as the characteristics of the braking system of cars used in international traffic. Each OSShD railroad will, for locomotives travelling over track gauges of 1435 mm or 1524 mm in direct international traffic, compile tables showing counterpoise and brake shoe pressure in tons.

Experts of the Eighth Committee Discuss VT [Verbrennungstriebwagen -- Self-Propelled Motor Car] and Diesel Trains

Representatives from OSShD railroads and the automotive industries of Hungary, East Germany, Poland, the USSR and Czechoslovakia participated in the discussions, which took place in Warsaw from 14 to 18 April, 1959. They considered:

- (1) Recommendations as to methods and a time sequence for repairs to VT-trains and diesel locomotives.

(2) Recommendations regarding the parameter and construction of self-propelled motor cars suitable for various transportation situations.

Under the first heading, the Polish representative submitted proposals for repair-and-maintenance regulations for self-propelled motor cars and trains made up of such cars. At the suggestion of the other railroad representatives, these were turned over for review to a sub-committee consisting of representatives from Hungary, East Germany, Poland and Czechoslovakia, before being taken up in full committee. Besides the operational experience of the member railroads, the Committee took into account certain well-known industrial practices, such as interchangeability of parts and plant versatility, which help reduce costs and time out of service. Its recommended repair schedule follows:

	After travelling	Repair cycle
Daily inspection		
Preventive-maintenance inspection	3,000-5,000 km	
Short-term repairs	10,000-15,000 km	60-1
Long-term repairs	50,000-75,000 km	12-1
Temporary repairs	100,000-150,000 km	6-1
Ordinary repairs	200,000-300,000 km	3-1
Major repairs	600,000-900,000 km	1

The Committee also made suggestions both as to the scope of the work to be done in the various categories and the drawing up of detailed regulations.

The Committee's working group submitted the repair proposals for diesel locomotives. In this instance, the extensive experience of the USSR can be of great value to those member railroads whose repair programs may still be in a state of flux. The Committee recommended the following:

	After travelling, 1000 km.	Switching time, hrs.	Days or months	Repair Cycle
Preventive-maintenance inspection	3 - 4	140-200	7-15 days	144-1
Short-term repairs	20 - 25	1200-1800	2-3 mos.	24-1
Long-term repairs	80 - 100	3600-5400	6-9 mos.	6-1
Temporary repairs	160 - 200	7200-10800	12-18 mos.	3-1
Major repairs	480 - 600	30,000	1500 days	1

The Committee made detailed suggestions regarding the work to be done in each category.

Three types of repair establishment were specified for work on diesels:

(1) Railroad repair plants, which will handle major repairs, and, in individual cases, temporary repairs. They have all the necessary equipment, and some of them can manufacture replacement parts.

(2) The larger railroad workshops, which will handle long- and short-term repairs and preventive-maintenance inspections. These have diesel locomotives assigned to them.

(3) Other workshops, which will handle only minor repairs and preventive-maintenance inspections.

The Committee issued directions to the repair plants and workshops for organizing their work and for improving their layout during the transition to diesel operation.

Under the second heading above, the Committee, augmented by representatives of the automotive industry, discussed the chief characteristics and design of self-propelled motor cars for 3 types of transportation situations:

- (1) Suburban and local traffic.
- (2) Local traffic with a low passenger density.
- (3) Long-distance and international traffic.

The members agreed on the desired characteristics, while taking into account the need to reduce the number of types, perfect the design and organize for quantity production. Their recommended technical data follow:

Basic characteristics	Type 1	Type 2	Type 3
Track gauge, mm.	1435/1524	1435/1524	1435/1524
Train make-up	1 motor car, 1 trailer coach 1 motor coach*	1 motor car+ 1 trailer coach	1 motor car + 2 trailer coaches + 1 motor car
Engine performance, hp	400 - 600	180 - 200	700 - 900
Mounting	beneath chassis	beneath chassis	on chassis
Transmission	hydraulic or hydro-mech.	mech. or hydro-mech.	hydro. or hydro-mech.
Car length, buffer to buffer, mm.	24,000	13,550	24,000
Car body width, mm.	2850/3100	3080	2850/3100
Car height, mm.	3600/3850	3400	3600/4000
Gross weight of motor car, tons	37/39	15	48/50
Gross weight of trailer coach	38/30	9.8	32/34
Maximum speed, kmh	120	90	140 - 160
Specific output, hp/ton	7.8-11.8/7.4-11.1	7.6-8.1	8.7-11.2/ 8.3-10.6
Seat weight, tons	380/350	220	800/730

*Other arrangements possible

The Committee also drew up a detailed description of the main structural parts of the machinery and carframe components. After the preliminary specifications have been approved by the member railroads and the Commission, they will be turned over to the RfgW, Standing Committee for Economic and Technical-Scientific Cooperation in Mechanical Engineering, whose third section (transportation engineering) will expedite planning and production.

First Meeting of the Committee for Highways and Highway Transportation (Eleventh Committee)

The meeting took place in April, 1959, in Warsaw, with delegations present from Bulgaria, Hungary, East Germany, China, North Korea, Mongolia, Poland, Rumania, the USSR and Czechoslovakia. This was the Committee's first real session, as the technical meetings in Sofia in 1957 and Berlin in 1958 were not of a permanent character, and were attended only by delegates from the European Socialist countries.

After consulting the material which had been prepared at the instigation of the Berlin meeting, the members placed the following questions on the agenda:

- (1) Centralized control of freight shipped by public highway transport.
- (2) International highway traffic between the Socialist countries. International treaties and conventions and their applicability to the Socialist countries.
- (3) Working regulations for the Committee.
- (4) Committee plans for 1959.

The Committee received a report, specially prepared for it by the Ministry of Highways and Highway Transportation of the RSFSR, covering the subject matter of the 1st question above. The report shows that centralized control of freight in the USSR first began in 1951, and that in 1956 more than 274 million tons were shipped under this system. The net costs of such public shipments per ton/kilometer were about 28% less than for freight shipped at industrial plants under other systems. In Moscow in 1956, centralized control was exercised over 65% of construction materials shipped for use in city projects, 50% of official city freight, 28% of freight destined for trade organizations, and 78% of the freight leaving railroad stations for local destinations.

It was the consensus of the delegates that other Socialist countries have also had varying degrees of experience in this field, which, making allowance for local conditions, could be exploited to the benefit of all. To this end, they called upon the OSShD member railroads to submit to the Committee regular reports on the following:

- (1) Industrial management methods followed in setting up organizations for centralized freight control.
- (2) Methods followed in planning vehicle utilization schedules.
- (3) Methods of organizing dispatcher services and the paper work involved in reporting and clearing arrangements.

The Polish Transportation Ministry had prepared for the Committee a report on the subject matter of the 2nd question, above, listing the following:

Convention on Highway Transportation, Protocol on Road Signs and Signals

General Agreement on the Economic Regulation of International Highway Transportation and Standard Procedures for Publishing Regulations

Convention on International Freight Shipments over Highway Transportation Systems

European Agreement on the International Shipment of Dangerous Freight

Customs Agreement on Bonded and Sealed International Freight Shipments under TIR

Customs Agreement on the Temporary Admission of Commercial Vehicles

Customs Agreement on Containers

Convention on Taxing Vehicles Carrying Passengers and Freight in International Transportation

Convention on Taxing Private Vehicles Used in International Transportation

These agreements embody certain administrative-economic standards, approaching the force of civil law, which provide a frame of reference for developing standard procedures for regulating international shipments.

It was proposed that a similar frame of reference be developed for shipments between the Socialist countries. In view of the growing importance of international highway shipments and the tendency toward standardization of international regulations, the Committee made the following recommendations to the OSShD:

- (1) That a working group of experts be formed to study the above questions. It should submit a report to the next meeting of the Committee.
- (2) That during 1959 interested OSShD members conclude bi-lateral agreements on shipments. In so doing, they should consider the relevant portions of the international agreements and regulations that have been evolved by the Domestic Transportation Committee of the European Economic Commission of the UNO.

The Committee is the only one under the Railroad Transportation Commission which occupies itself with all questions concerning highways and highway transportation. It will function in conformance with Commission statutes and directives of the Conference of Ministers.

During 1959, the Committee will take up the following:

- (1) An analysis of the system of retiring vehicles from service, taking into account the system's effect on operating costs.
- (2) Basic principles involved in drawing up tariffs on freight and passengers in international traffic.
- (3) Uniform road signs and drivers' permits for the Socialist countries.
- (4) Possible development of a specialized industry to produce equipment used by garages, to ensure that the needs of OSShD members will be met.
- (5) Scientific research in accordance with the long-range plan of the Conference of Ministers.

MISCELLANEOUS NEWS ITEMS

China - Sharp Increase in Capacity of Transportation Systems

There was a total of 29,880 km of track in use at the end of 1957, 21.4% more than in 1952. 33 new lines were built during the 5-Year Plan. In 1958, a beginning was made on 55 new lines, 29 double-tracked

stretches, and the rebuilding of other lines. A total of 2376 km of track (1043.8 km of it double-tracked) will be laid during this year, twice as much as in 1957.

At the end of 1957, there were more than 230,000 km of highways in the entire country, twice as much as in 1952. The amount of freight moved by highway transport during the year exceeded the planned tonnage by 14%. In 1958, 150,000 km of highway were built, including unsurfaced roads. This was 8 times more than in the previous year.

At the end of 1958, there were 30,203 km of railroads, 400,000 of highways, 150,000 on inland waterways, and 33,000 of civil airways.

Poland - Extensive Modernization of the State Railways

First on the modernization program set for the railroads under the national 7-Year Economic Plan is the electrification and converting to diesel of all main lines. 5,000 km of track will be provided with extra-heavy-duty rails. Another 1600 km will be ballasted. Beginning in 1961, a million reinforced-concrete ties will be laid yearly, resulting in a saving of 612,000 cubic meters of wood in 6 years. 2000 km of welded, continuous track will be laid by 1965. Much of the money being made available will be spent for modernizing junctions, with 600 to 700 million zloty going to rebuild the junction line running through the center of Warsaw, and to rebuild the city's stations destroyed by the German Fascists in World War II.

The traffic-handling capacity of rail lines and switching stations will be considerably increased as a result of thorough modernization of signal and safety equipment, which will, however, cost relatively little. The railways will get 150% more electrical equipment each year through 1965 than they did in the years before 1958. A successful new switch motor will, following the electrification of 6,000 switches, save about 1 million zloty. Though considerably smaller than that now in use, it performs equally well.

About 950 km of main lines (including that between Warsaw and Gliwice) and the areas surrounding several electrified major junctions will get automatic block stations containing the latest train control equipment. Various single-track lines will get remote-control equipment, which is already being installed in the Otwock-Pilawa and Pruszcz Gdanski-Wisla Most sectors along the coast. In hump yards, electromagnetic rail brakes and other equipment are being installed, by which the cars will be retarded automatically. About 60 large and small stations will be equipped with modern relay devices. Train dispatching

will be made more efficient through the use of radio communication between yard and train personnel. The use of mobile, transistorized radio, and television equipment is anticipated.

East Germany - Television for the State Railways

The railroads are investigating the suitability of industrial television now in use for their own, more rugged operating conditions. The remote-observation equipment selected will be adapted to railroad purposes under the designation FBA-1. It will be consisted of a camera unit, video cable and operating cable. Pickup tubes sensitive to infrared will make it possible to use the equipment at switching yards under dark-ray conditions, without having to rely on illumination by spotlights and built-in intensive fittings. The equipment will have to be completely weather-resistant. A waterproof, heat-dissipating housing will be provided for the operating unit and pickup camera. Panes will be heated to prevent the depositing of condensation moisture.

Bibliography

Technical Literature in the Bulgarian People's Republic

The Ministry for Transportation and Telecommunications is publishing the studies of Bulgarian authors and translations from all fields of transportation to improve the qualifications of the Bulgarian railroad personnel.

The Technical-Scientific Research Institute of that Ministry is publishing a Bulletin for the leading functionaries. Further, the Ministry releases instructions for the training of students of the intermediate railroad school and of the railroad technical schools.

The Ministry and the union of the workers in transportation and communications are the publishers of the newspaper, "Transporten glas" (The Voice of Transportation), which appears semi-weekly in 24,000 copies. This paper publicizes the tasks of the field of transportation and communication, new progressive work-methods, and cultural-political work. Its main task is to help fulfill in three to four years the tasks of fulfilling the Five-Year Plan as set by the party and government for transportation.

The monthly journal, "Transportno Delo" (Transportation Affairs), plays an important role in the specialized literature of the country. It has a technical-scientific character and appeals to the leading and middle cadres. It publishes articles which serve to increase the quality of work, the employment of electric and Diesel engines, the utilization of inner reserves, and the use of new work-methods. It is especially concerned with the technical-economic progress of the railways. The journal is divided into the sections: foreign transport, rationalization processes, innovations in transportation, and bibliography.

Mimeographed plant newspapers are published in the railway administrations of Sofia, Plowdiv, and Gorna-Orjahoviza, and in the other large railway centers, repair shops, and operating plants. They are the organs of the local party and union organizations for the mobilization of their members for the fulfillment of production tasks. We believe that the significance of the specialized literature in the socialized countries has risen because of the Organization for Railroad Cooperation, OSShD

Pajtchev

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In the issue No. 2/59 we printed on page 23 an article from the Bulgarian People's Republic: "1500 km of Rail Lines to be Electrified." In the last line of the first paragraph instead of 137,00 leva it should read 13,799 stotinka.

Increase in Efficiency of New Types of Train Propulsion

In the book by S. S. Ushakov are discussed the possibilities of increasing the efficiency of new types of train propulsion by means of improved locomotive characteristics, decrease of capital investment, practical distribution of the types, perfecting of operating methods, and other measures.

A comparison of technical-economic index figures for various propulsion types is provided.

The book is intended for the technical engineering personnel of the railways.

Moscow: Transzhelizdat, 1959; 303 pages with illustrations; bibliography: pages 300-301 (35 titles).

Principles of Railway-Technical Power Dynamics

The author of this book, recently published by Technical Book Publishers of Leipzig [Fachbuchverlag Leipzig], Certified Engineer Erich Stalzer, treats in 63 pages a special branch of technical mechanics: the physical regularity of the driving movement. Proceeding from the natural, straight-line movement of rail vehicles, he deals with the influence of the rails, the forces affecting the movement of vehicles, and the various resistances in an exact, scientific investigation.

The author then deals with the power dynamics of switching operations, particularly with the situation of shunting mechanisms, in which the varying conditions according to the type of gradients and the acceleration speed are decisive.

Included are the counter-effects of car brakes, brake shoes, and track brakes. The investigation of locomotive power of various types of propulsion vehicles and the calculation of schedules are built on this basis. The whole presentation is supported by diagrams and illustrations.

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The state Railway-Transport Publisher in the USSR - Transzhelizdat - planned to publish about 200 titles in 1959. A major portion has already appeared.

Heavy-Duty Trains (Experiments, Theoretical Investigations, and Technical-Economic Efficiency)

The author, V. S. Deyev, evaluates the experiences gathered in the operation of heavy-duty trains; he names the favorable methods of operating heavy-duty trains and their theoretical bases, the progressive methods for organizing the trains and the methods of determining their economic efficiency. The book is intended for the scientific, technical engineering, and supervisory railroad personnel.

Moscow: Transzheldorizdat, 1959; 332 pages with illustrations; bibliography: pages 329-330 (32 titles).

The Principles for International Freight Traffic and International Railway Organization

It is not easy to write on international freight law in short but generally understandable form and to separate the important from the unimportant. In this the author, Viktor Kolloch, has succeeded in a brochure recently published by the Technical Book Publishers in Leipzig. He deals especially in this study with the "international agreement on railway freight traffic" (CIM). He also treats the international railway freight tariffs and the basic principles of the related freight distribution, as well as the international railroad organizations UIC, ITK, LIM, and RIV according to character, purpose, and aims. The tasks of the European Economic Commission (EEC) are also explained in detail. The work numbers 95 pages and is intended as a training and reference book for railway apprentices and practitioners.

Utilization of Carrying Capacity of Cars

The most important ways to a better utilization of the carrying capacity of cars are described by A. P. Leontyev and J. N. Tikhonchuk, and questions of economic gain through increased loading of cars are illuminated.

The book is intended for technical-engineering staff of operating and traffic services, of stations, and of divisions of the railways, as well as for personnel of connecting lines.

Transzheldorizdat, 1959; 266 pages with illustrations.

Operating Principles for the Equipment of Safety and Communications Systems

The systems of safety and communications equipment and their use for the various conditions of rail traffic organization and switching are treated by B. S. Ryazanzev and B. A. Rodimov.

The book is intended for technical engineering personnel of the traffic service and of signal and communications systems, for designers of SZB equipment and other personnel connected with planning, building, and operation of safety and communications equipment on the railways.

Moscow: Transzheldorizdat, 1959; 407 pages with illustrations; 5 pages of drawings; bibliography: pages 403-404 (30 titles).

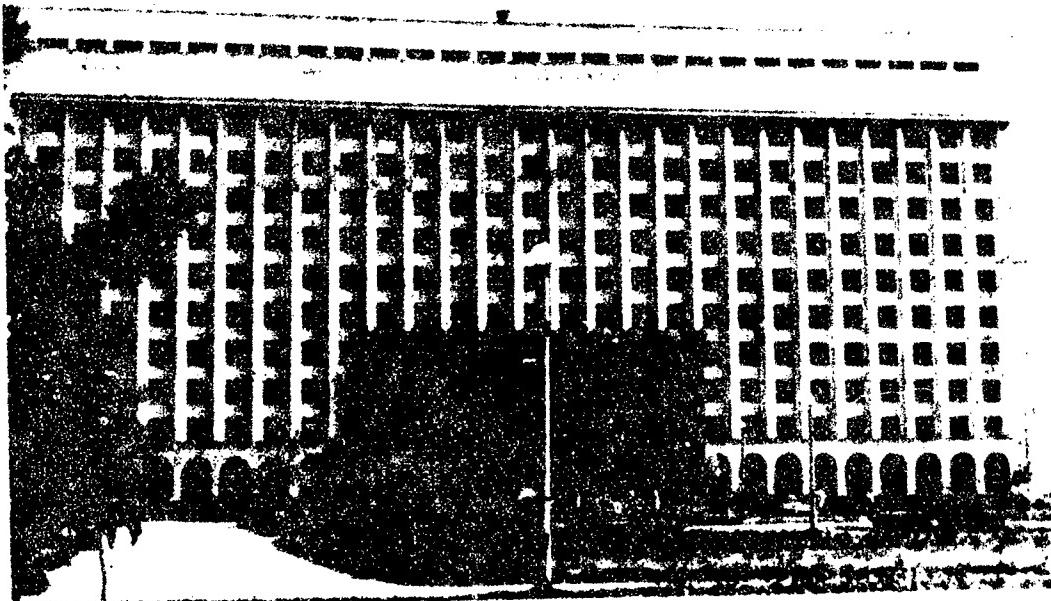
Technical Training for the Railway Profession'

In this book the fundamental questions of organization and method in courses for cadres in technical schools and in teaching at the brigade level. Recommendations are given for the organization of teaching for methodical, educational, and cultural mass work among students, as well as for the furnishing of classrooms and workshops.

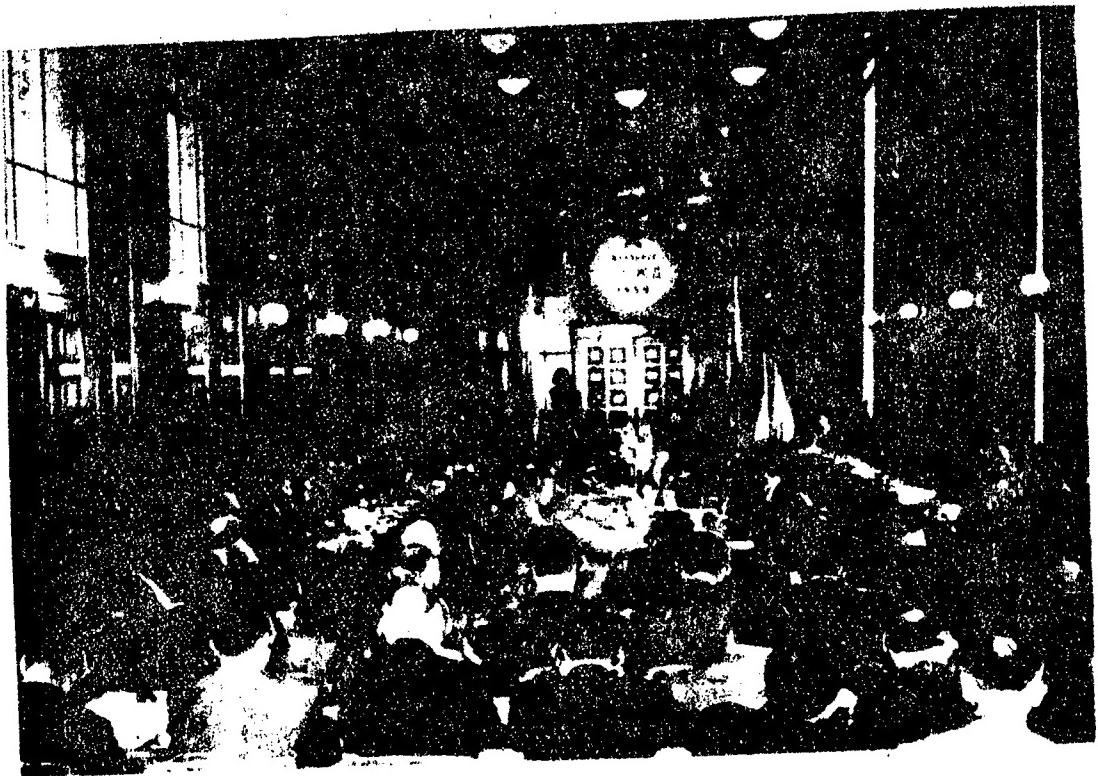
The book, by K. K. Brokorenko, Vl N. Ignatov, and B. J. Petrov, is designed for leading personnel and inspectors of school divisions, engineers for technical training, teachers, and instructors.

Moscow: Transzheldorizdat, 1959; 256 pages with illustrations; bibliography, page 253 (15 titles).

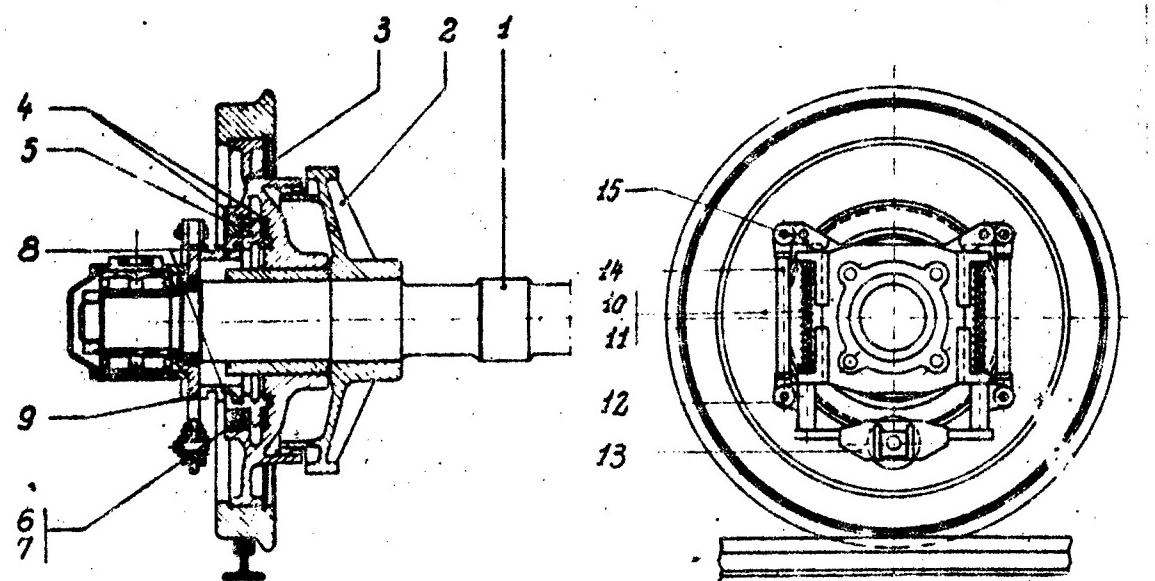
FIGURE APPENDIX



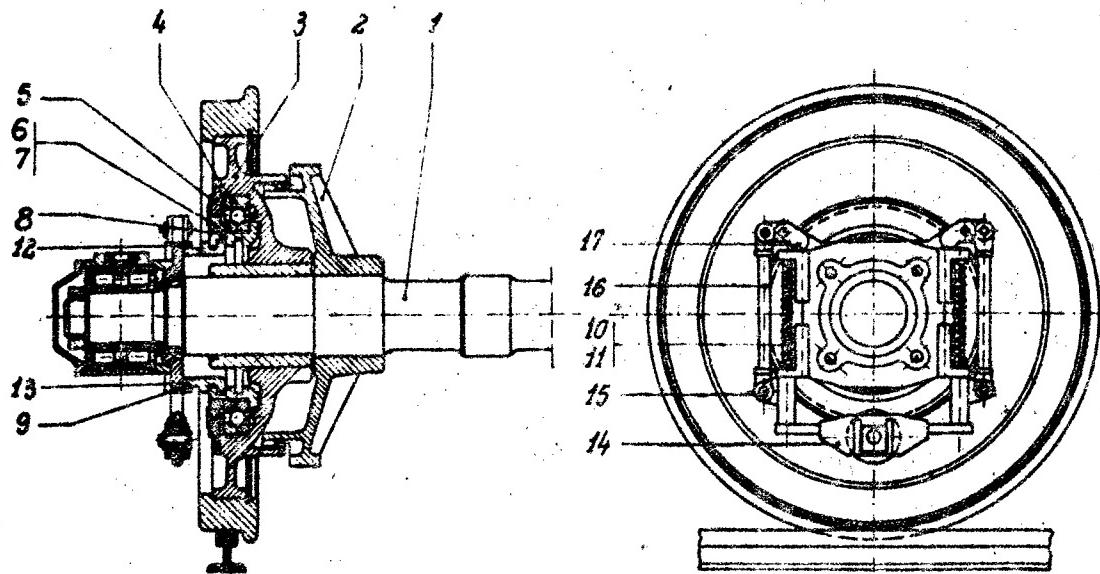
Main building of the Ministry of Transportation and Communications,
scene of the fourth meeting of the Conference of Ministers.
[Page 1]



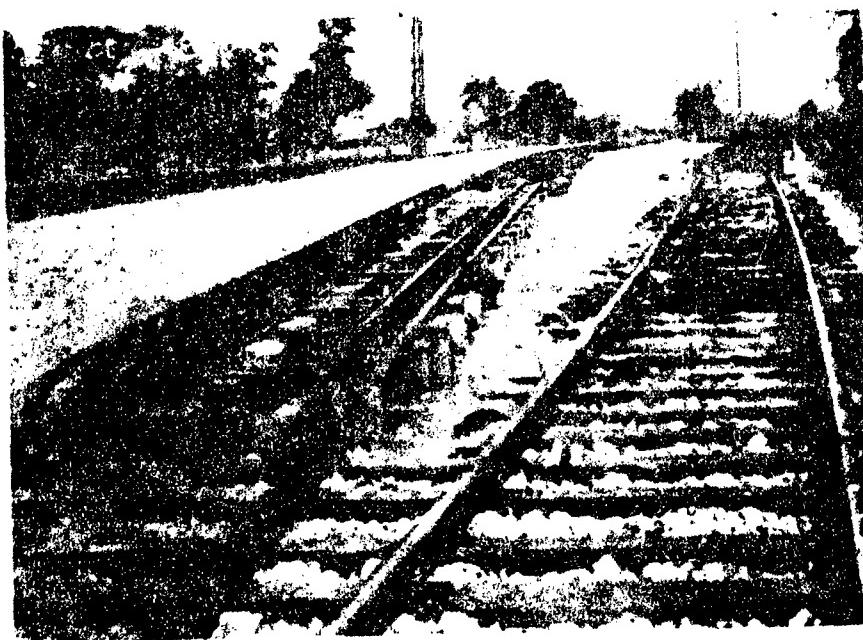
View of the conference room. [Page 2]



KrN I Gauge-adaptable wheel set [Page 5]



KrN II Gauge-adaptable wheel set [Page 5]



Gauge change-over track layout for KrW I and KrN II adaptable wheel sets [Page 6]



View of the housing on the pivot of the brake-triangle shaft in the Kiesky brakeshoe system. When the wheel disc is in adjustment, the brake shoe is caught by the clamp. The powerful spring contracts and holds the brakeshoe firm in its new position.



Figure 1

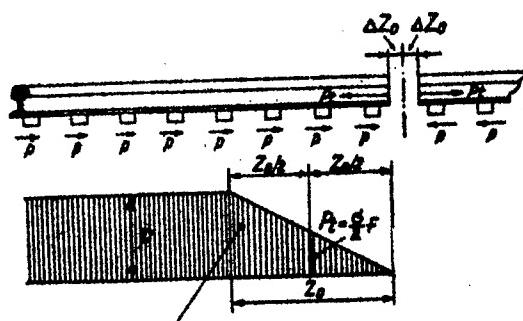


Figure 2. The checked contractive force

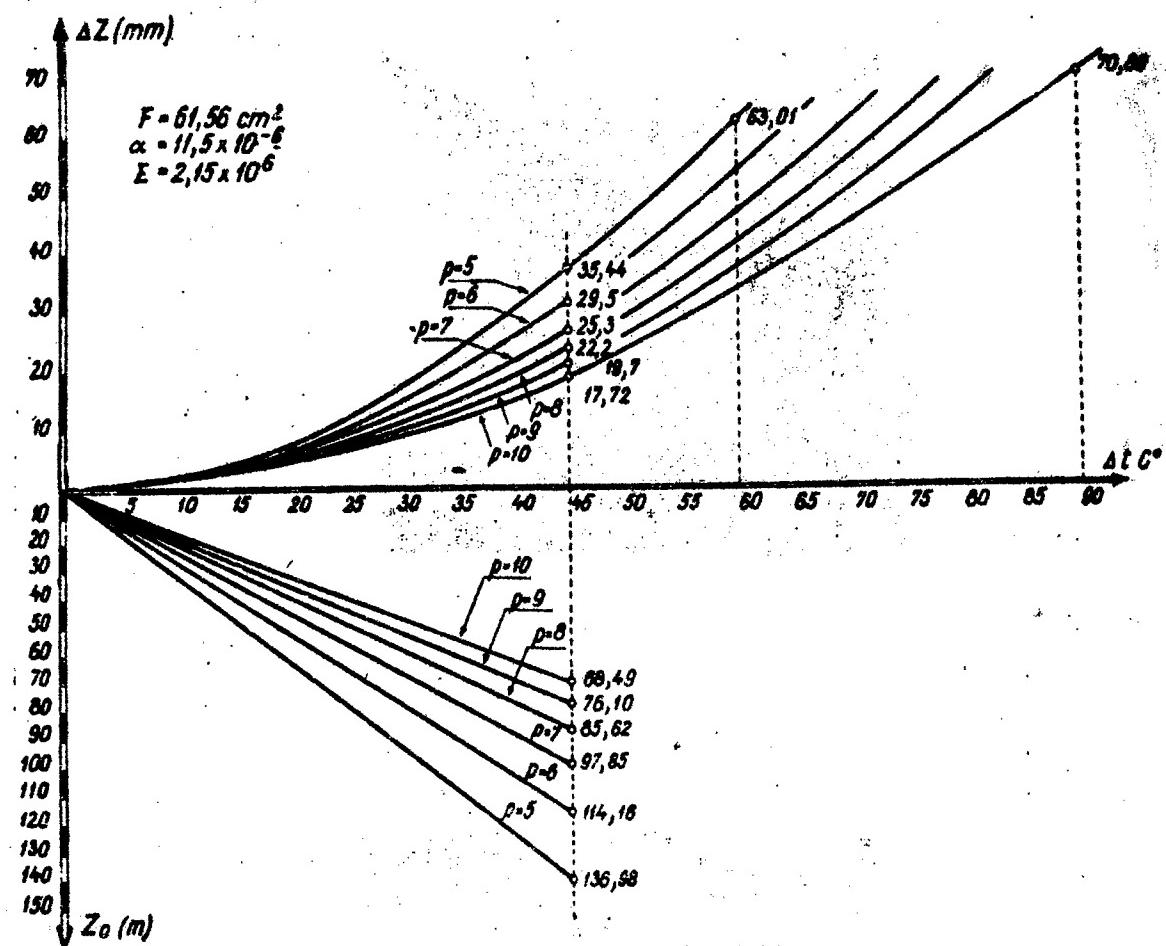
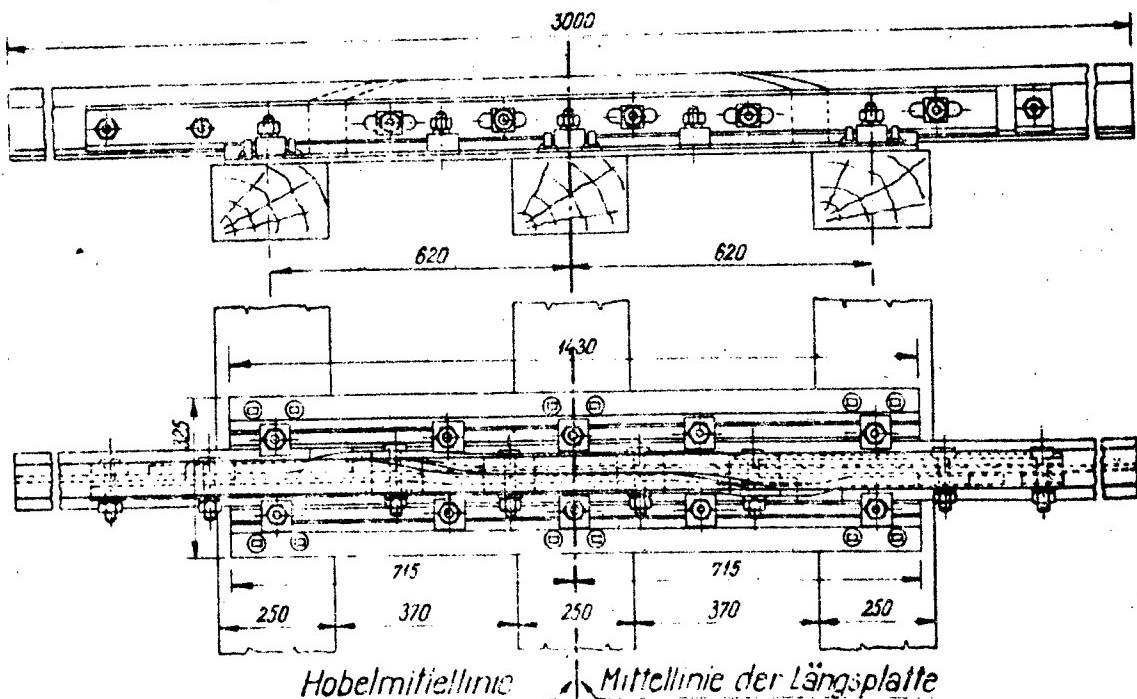


Figure 3



Center line of finished
rail-tongue surface

Centerline of
baseplate

Figure 4

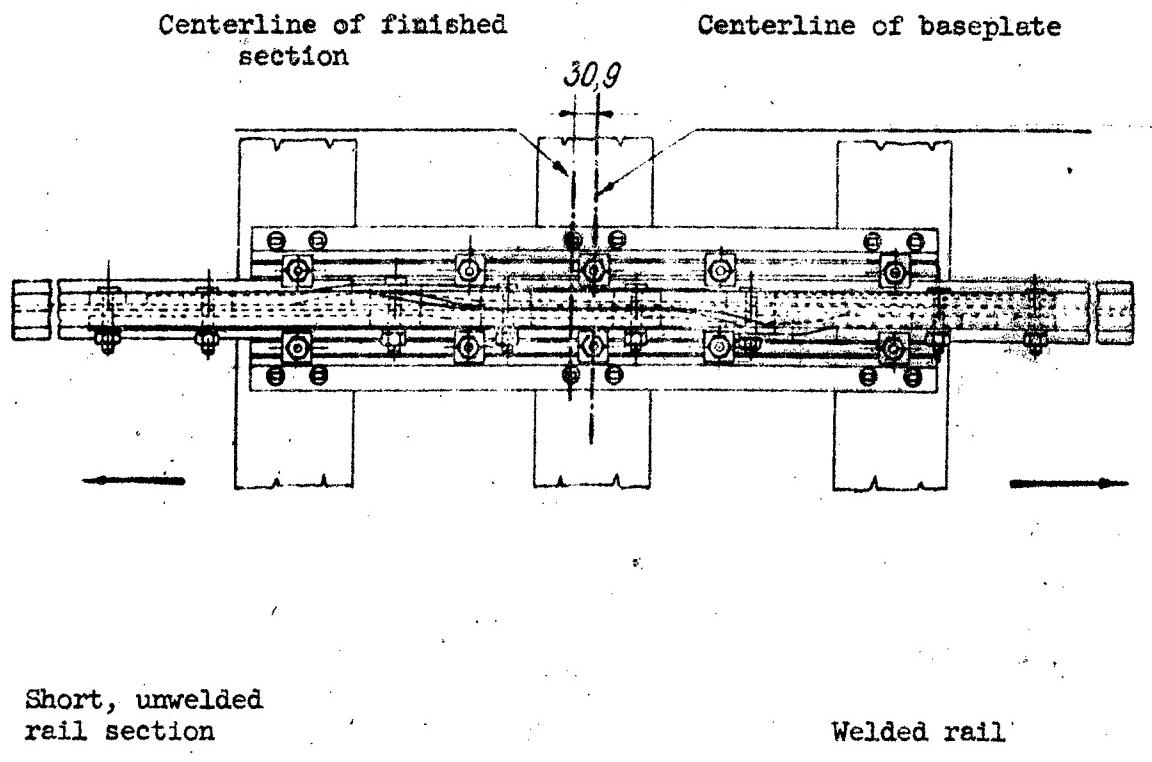


Figure 5

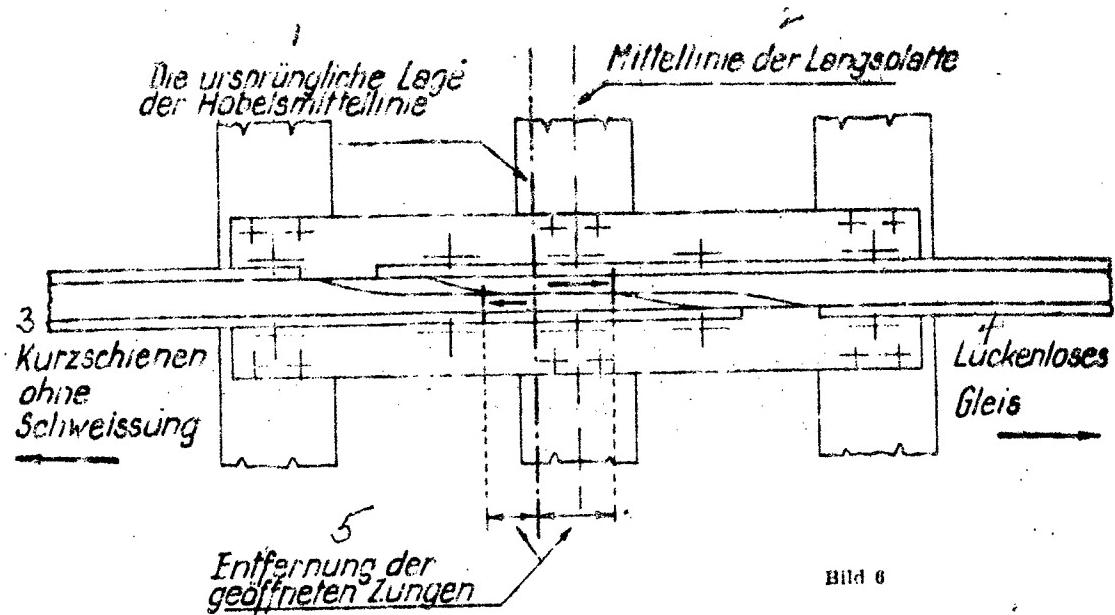


Bild 6

Figure 6

Legend:

- 1 - Original position of finished section centerline
- 2 - Centerline of baseplate
- 3 - Short unwelded rail section
- 4 - Welded rail
- 5 - Distance between the opened tongues

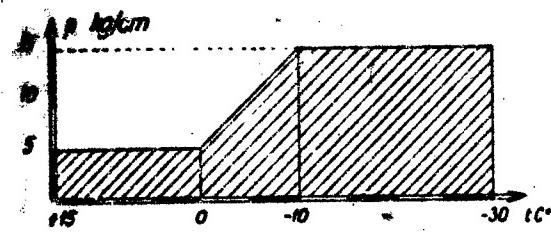


Diagram [Page 15]

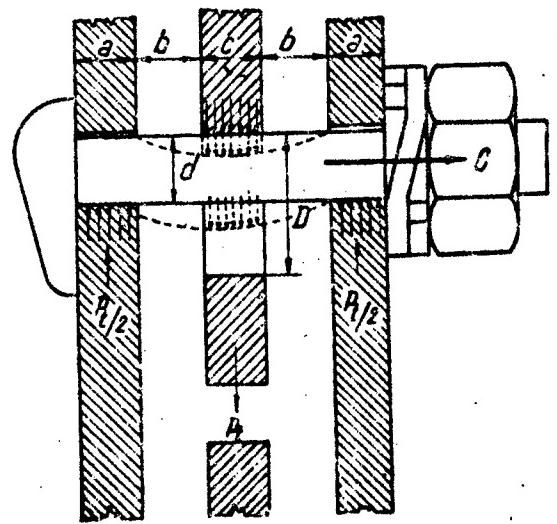


Figure 7

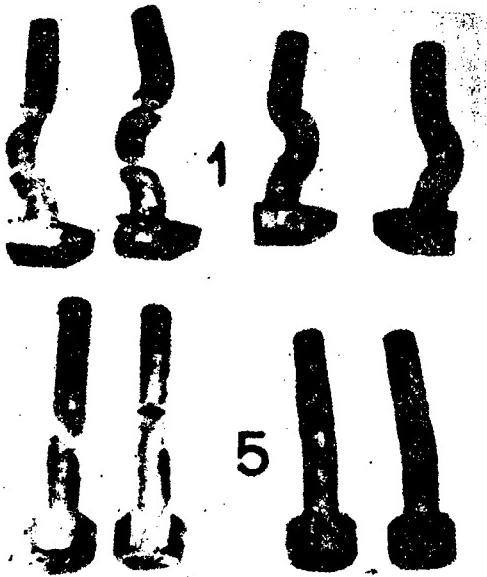


Figure 8

5831

END